



# Using Technology to Construct Alternate Portfolios of Students with Moderate and Severe Disabilities

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The 1997 Amendments to the Individuals with Disabilities Education Act (IDEA '97) require that all states include students with disabilities in their measures of accountability. Such measures may be part of the statewide and districtwide general education assessment programs through appropriate accommodations or through alternate assessments for those who cannot complete the general education assessment (Kleinert & Kearns, 1999).

## Inclusion in Statewide Assessments

Since 1992, Kentucky has been including all students in the statewide assessment and going beyond federal regulations by including all students in the accountability system. Students receiving special education services are assessed in one of three ways:

- Through participation in the general education assessment program.
- Through participation in the general assessment program with accommodations.

- Through participation in the alternate portfolio system.

This article shares how the students in one classroom achieved "Distinguished" ratings, the highest of ratings, on their alternate portfolios, using assistive technology (see box, "What Is an Alternate Portfolio?").

## Student Profiles

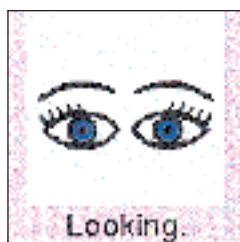
We conducted multiple case studies in one Kentucky classroom for students with moderate to severe cognitive disabilities to explore the process of using the IntelliKeys keyboard as an alternative computer input device for the production of the alternate portfolio. The classroom is located in a small elementary school (430 fourth- and fifth-grade students) in rural Kentucky. The students receive instruction in the general education classroom, the community, and a special class. The teacher has 12 years' experience serving students in both the general and special education environment, is a recent graduate of an assistive technology educational specialist degree program, and holds an Assistive Technology Practitioner certificate. The students use a selection of assistive technology devices commensurate with their needs, to include single communication aids; a variety of switches to access tape recorders, electric kitchen mixer, and television through an environmental control; and an adaptive keyboard with custom overlays to access the computer.

Four of the seven students in the class were in the age groups of students in the fourth and eighth grades and were thus required to participate in the Kentucky assessment program. Three were 9-year-old females, and one was a 13-year-old male. Two students were classified as having severe cognitive disabilities and two as having multiple disabilities. Table 1 (page 12) describes these students further, according to physical, cognitive, and behavioral domains. The teacher determined that they qualified to participate in the assessment by completing an alternate portfolio.

Each of the four students was required to produce five entries for their alternate portfolio, in addition to demonstrating their use of a daily schedule and writing a letter to the reviewers. Table 2 (page 13) shows the activities selected for these students to illustrate Kentucky's academic expectations within four content areas. Statements in black are target skills, and statements in italic are questions they had to respond to in order to demonstrate that skill. For example, Amanda demonstrated her computation skills by responding to the question "Did I count the cans?" on her activity sheet for loading the soda machine. One curricular area entry for each student was the focus of the study and is used to demonstrate the assessment process.

All four students were unable to use the standard computer keyboard effec-

**How do we provide alternate assessments for those who cannot complete the general education assessment?**



### What Is an Alternate Portfolio?

The alternate portfolio showcases student work where educators can assess learning across life domain activities in a comprehensive way. It represents performance-based evaluation, using a multidisciplinary approach, and models the use of holistic scoring. As with the general education portfolio scoring system, educators score alternate portfolios on four different levels: novice, apprentice, proficient, and distinguished. To qualify for a distinguished score, the highest level, the student must show the following:

- Progress on specifically targeted skills that are meaningful in current and future environments.
- Planning, monitoring, and evaluating self progress.
- Evaluation used to extend performance.
- Extensive evidence of Kentucky Academic Expectations in all entries.
- Natural supports.
- Use of adaptations, modifications, and/or assistive technology to evidence independence.
- Performance occurring in a variety of integrated settings, within and across all entries.
- Clearly established mutual friendship(s) with peers without disabilities.
- Choice and control in age-appropriate portfolio products within and across all entries.

The alternate portfolio assessment was designed by Kentucky educators specifically for those students whose limitations in cognitive function prevented completion of the standard assessment program (see box, "Alternate Portfolios in Kentucky"). Eligibility is determined by the IEP committee, by considering cognitive function, adaptive behavior, cause of limited function, application skill level, use of community-based instruction, and level of performance with supports. Kleinert, Kearns, and Kennedy (1997) stated that between 0.5% and 1.0% of the public school students meet such requirements.

In addition to becoming part of the school's accountability indexes, alternate portfolios serve as "an 'instructional organizer' to give clarity and focus to the student's daily educational program, and as a teaching tool for students to learn higher order self-management, planning, and self-evaluation skills" (Kleinert, Haigh, Kearns, & Kennedy, 2000, p. 24). Such organizers provide teachers with a solid framework from which to work.

#### Alternate Portfolios in Kentucky

For more information about alternate portfolios, as implemented in Kentucky, visit the following Web sites:

Kentucky Alternate Portfolio Online

<http://www.ihdi.uky.edu/projects/KAP/>

Kentucky Alternate Portfolio Assessment Teacher's Guide (PDF format)

<http://www.ihdi.uky.edu/projects/KAP/downloads/ap%20book99.pdf>

tively. The teacher determined that the IntelliKeys keyboard was an appropriate adaptation for each. Three of the students used switches plugged into the IntelliKeys, in addition to the IntelliKeys keyboard itself. The switches were used to highlight and read text on the activity sheet with the use of text reading software.

The teacher constructed a custom overlay for each student, using Overlay Maker (IntelliTools, 1996) to support each student's individual needs. The overlay provided response choices to be used in the completion of a data sheet that was displayed on the computer (see Figure 1 on page 14). By pressing a response choice on the overlay, the student caused the text programmed into that cell to be entered into the data sheet. The amount of text in the response depended on the student's level of functioning. For example, one student was able to record a complete sentence by sequencing three response choices, whereas another had only "yes" or "no" programmed as response choices. Color and location were used on the overlays to provide visual cues as

**Students used a smorgasbord of assistive technology: single communication aids; a variety of switches to access tape recorders, electric kitchen mixer, and television through an environmental control; and an adaptive keyboard with custom overlays to access the computer.**

**Table 1. Profile of the Students in the Study**

Subject	Physical Characteristics	Cognitive Characteristics	Behavioral Characteristics	Disability
<b>Sandra Age 9</b>	Hearing impaired; hyperactive; impaired speech	Exceedingly low academic ability compared with typical peers	Noncompliant; resists authority	Multiple: hearing impaired and severe cognitive disability
<b>Christine Age 9</b>	Low to fluctuating tone; nonambulatory; verbal though not clearly understood by anyone other than parent	Exceedingly low academic ability compared with typical peers	Friendly but demanding; persistent presence	Multiple: physical and severe cognitive disability
<b>Amanda Age 9</b>	Small, ample stamina to function well with peers	Very low academic ability; beginning academics; delayed language skills	Friendly, predominantly smiling; enjoys being the center of attention; loud; silly behaviors	Severe cognitive disability
<b>Brent Age 13</b>	Very small and thin; exhibits self-stimulatory behaviors; non-verbal; ambulatory but resistant	Nonparticipatory	Self-stimulatory behaviors; little response to peers or adults; very little interaction with others	Severe cognitive disability

to which response choices should be used for each of the assessment questions. Figure 2 (page 15) is an example of one student's overlay.

The teacher provided a short training session for each student and one peer buddy on all components of the assessment process. For each student, the IntelliKeys with a custom overlay was used to respond to the assessment questions. The teacher created an activity data sheet using a word processor with table capabilities (Microsoft, 1997). Figure 1 shows one of these activity data sheets. The text-to-speech feature of the software (textHELP! 1999) was used to read each assessment question to the student. The student responded

using the custom overlay, and their answer was read back to them so they could confirm the correctness of the answer.

Each student had content area tasks for which they were responsible. One student was in charge of filling the soda machine; another, shopping for ingredients for a cooking activity. After the activities were completed, they rated and commented on their performance using the activity data sheet. With a peer, they sat at the computer workstation. They responded to the assessment questions that were read aloud by the computer, using the activity-specific IntelliKeys overlay to "type" their response to each question. The peer provided prompts and assistance when needed. On the activity sheet, independent responses were recorded in blue and assisted responses were recorded in red. Based on that record, each student's level of independence was determined across four trials. Table 3 (page 14) shows the increase in independence across the trials for each student.

## Examples of Student Use of Portfolio Entries

### Amanda

We used Amanda's math entry for this study with the following activities: (a) filling the soda machine with a peer, (b) taking cans to the recycling center, and (c) purchasing items at the store. Targeting improvement in computation and money skills, Amanda planned, monitored, and evaluated her activities by using the IntelliKeys and the custom overlay to respond to the questions on the activity sheet. The activity sheets and overlays were designed to allow Amanda to read the text with the text-reading software and construct a variety of sentences in response to the questions posed on the activity sheet. The response keys on the custom overlay were grouped according to color and use to facilitate correct choice (Figure 3 on page 15).

On the first trial activity sheet, 48% of Amanda's responses were made independently. By the fourth trial, Amanda had increased her independence to

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**The teacher provided a short training session for each student and one peer buddy on all components of the assessment process.**

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**Table 2. Student Evidence of Performing Each of the Nine Criteria for a "Distinguished" Rating**

	Amanda: Math	Christine: Lang. Arts	Sandra: Soc. Studies	Brent: Science
<b>Assessment Dimension and Requirements of the Alternate Portfolio</b>	<ul style="list-style-type: none"> <li>Using word machines</li> <li>Receiving prompts</li> <li>Engaging at all times</li> </ul>	<ul style="list-style-type: none"> <li>Following</li> <li>Exchanging prompts for guessing</li> </ul>	<ul style="list-style-type: none"> <li>Actively</li> <li>Shopping for art supplies</li> </ul>	<ul style="list-style-type: none"> <li>Following</li> <li>Exchanging prompts for guessing</li> </ul>
<b>Performance:</b>				
Using computer for independent skills which are moving into written and future documents	Increased accuracy by 20% accuracy in computer and writing skills. <i>Did I write the words?</i>	Increased accuracy by 20% accuracy in writing skills. <i>Did I write the words?</i>	Increased accuracy by 20% accuracy in writing skills. <i>Did I write the words?</i>	Increased accuracy by 20% accuracy in writing skills. <i>Did I write the words?</i>
Planning, monitoring, and evaluating self progress	Evaluating performance. <i>Did I say I was ready?</i>	Reporting and following a sequence of tasks. <i>Was I able to read?</i>	Following a sequence of tasks. <i>Did I know what to do?</i>	Following a sequence of tasks. <i>Did I know what to do?</i>
Evaluation and extend performance	Developing a quality choice using visual evaluation. <i>Was I able to read?</i>	Developing a quality choice using visual evaluation. <i>Did I say I was ready?</i>	Developing a quality choice using visual evaluation. <i>Did I say I was ready?</i>	Developing a quality choice using visual evaluation. <i>Did I say I was ready?</i>
Exclusion of subject of Kentucky American representation at all times	Exclusion of subject of Kentucky American representation at all times. <i>Did I say I was ready?</i>	Exclusion of subject of Kentucky American representation at all times. <i>Did I say I was ready?</i>	Exclusion of subject of Kentucky American representation at all times. <i>Did I say I was ready?</i>	Exclusion of subject of Kentucky American representation at all times. <i>Did I say I was ready?</i>
<b>Supports:</b>				
Use of adaptations, modifications, and assistive technology as needed independent	Use of adaptations, modifications, and assistive technology as needed independent. <i>Did I say I was ready?</i>	Use of adaptations, modifications, and assistive technology as needed independent. <i>Did I say I was ready?</i>	Use of adaptations, modifications, and assistive technology as needed independent. <i>Did I say I was ready?</i>	Use of adaptations, modifications, and assistive technology as needed independent. <i>Did I say I was ready?</i>
<b>Settings:</b>				
Performance occurring in a variety of settings, within all settings, within all settings	Teacher's lounge, office, classroom, kitchen, store. <i>Where did I go?</i>	Classroom, kitchen, store, teacher's lounge, office. <i>Where did I go?</i>	Art room, classroom, kitchen, store. <i>Where did I go?</i>	Classroom, kitchen, store, teacher's lounge, office. <i>Where did I go?</i>
<b>Social Relationships:</b>				
Time spent in activities with peers in the state of Kentucky	Time spent in activities with peers in the state of Kentucky. <i>Was I able to read?</i>	Time spent in activities with peers in the state of Kentucky. <i>Was I able to read?</i>	Time spent in activities with peers in the state of Kentucky. <i>Was I able to read?</i>	Time spent in activities with peers in the state of Kentucky. <i>Was I able to read?</i>
<b>Context:</b>				
Use of adaptations, modifications, and assistive technology as needed independent	Use of adaptations, modifications, and assistive technology as needed independent. <i>Did I say I was ready?</i>	Use of adaptations, modifications, and assistive technology as needed independent. <i>Did I say I was ready?</i>	Use of adaptations, modifications, and assistive technology as needed independent. <i>Did I say I was ready?</i>	Use of adaptations, modifications, and assistive technology as needed independent. <i>Did I say I was ready?</i>

88%. Figure 4 (page 15) illustrates how on one response item, the quality of her responses also improved. Before using the IntelliKeys, Amanda was limited to handwriting her responses, which was painstakingly slow. The IntelliKeys system allowed her to write 56 words in 20 minutes, a feat she could not have accomplished without it. Amanda's reaction to the IntelliKeys system was, "This is neat."

## Christine

Christine's alternate portfolio activities targeted her language arts objectives. She engaged in two activities to demon-

strate her achievements: cooking and buying items from the store. Before using the IntelliKeys for recording responses, Christine was limited to using a rubber stamp to indicate a yes/no response to questions on the activity sheets. That was accomplished with physical assistance from a peer or adult to assist in stamping and reading the questions. The overlay was designed to be simple, with large keys outlined in black. The keys were arranged by color and location to facilitate correct responses. The overlay keys also directly addressed her individualized education program (IEP) objectives—to visu-

ally scan pictures or objects from left to right or from top to bottom. Christine also used two color-coded single switches plugged into the IntelliKeys, to highlight activity sheet cells on the computer and to have it read each question. As with Amanda, by the fourth trial Christine had increased her performance level substantially, achieving 75% of her responses independently with the cooking activity sheet. Christine attended well to the reporting activity and appeared to enjoy the print output. She asked to take it home with her.

## Sandra

Sandra's portfolio demonstrated her achievements in social studies. She participated in two activities: shopping for art supplies, and participating in a general education art class. Sandra's overlays were simple, using color coding

**Table 3. Level of Independent Performance During Completion of Activity Sheets****Percentage of Responses Made Independently**

Student	Activity	Trial 1	Trial 2	Trial 3	Trial 4	Overall Gain
Amanda	Soda	48	56	72	88	25 %
	Recycle	55	66	82	71	
	Store	62	72	85	82	
Christine	Cooking	25	54	60	75	43 %
	Store	35	53	71	--	
Sandra	Art class	4	24	16	35	22 %
	Store	18	22	31	30	
Brent	Pet care	7	25	44	56	32 %
	Store	40	40	50	56	

**Figure 1. Soda Machine Activity Sheet**

Prompt	Response			
Date				
Did I use my schedule?				
Did I say I am ready?				
What will I do first?				
Did I use my sheet so I know what to do next?				
Where did I go?	Office Lounge	Office Lounge	Office Lounge	Office Lounge
Did I write what sodas were needed?				
Did I use my list to say what sodas were needed?				
Did I count the cans?				
Did I make a choice?				
How many cans did we need?				
Did I put the can in the right place?				
Did I do a good job?				
Did I try harder?				
Next time I will do better at ...	↗	↗	↗	↗
Who helped me today?				
What did my friend do?				

grinned and clapped as each entry was keyed into the cell, and read with the text reader as it was typed. She anxiously waited for the printed output so she could take it from the printer's paper tray.

**Brent**

Brent's example is for his science entry. Two custom overlays were used—one overlay was restricted to two cells

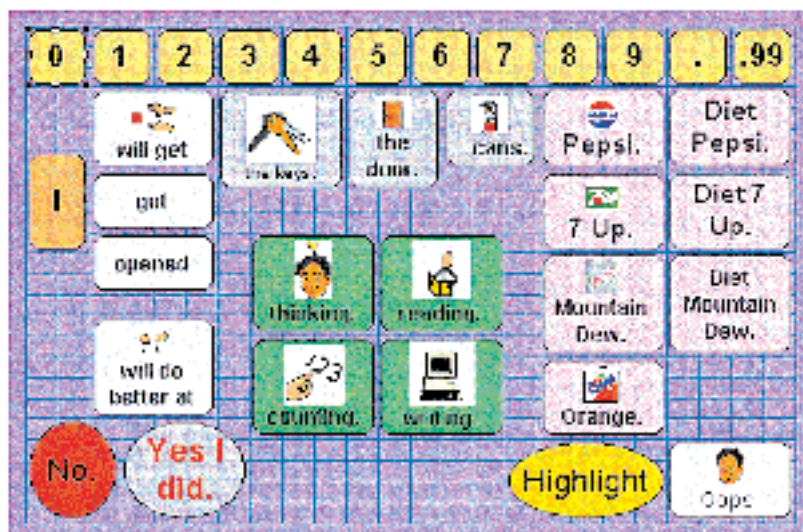
demonstrating a yes/no response to the activity sheet questions, and the other with five keys giving Brent the opportunity to document a high-quality independent choice over his area of improvement (Figure 5 on page 16). Two switches were used to highlight and read the text as with the other students.

Brent averaged a 32 % gain in independent performance. Brent's responses were more erratic than the others, but this is typical for Brent. He requires consistent cueing and often hand-over-hand instruction with physical cues. Brent is nonverbal and at present has an inconsistent system of communication. He required physical guidance to be seated and consistent cueing to remain seated. Brent's response to the question regarding improved performance was generated through activation of two out of five keys linked to his IEP goals and targeted skills. He consistently chose either the

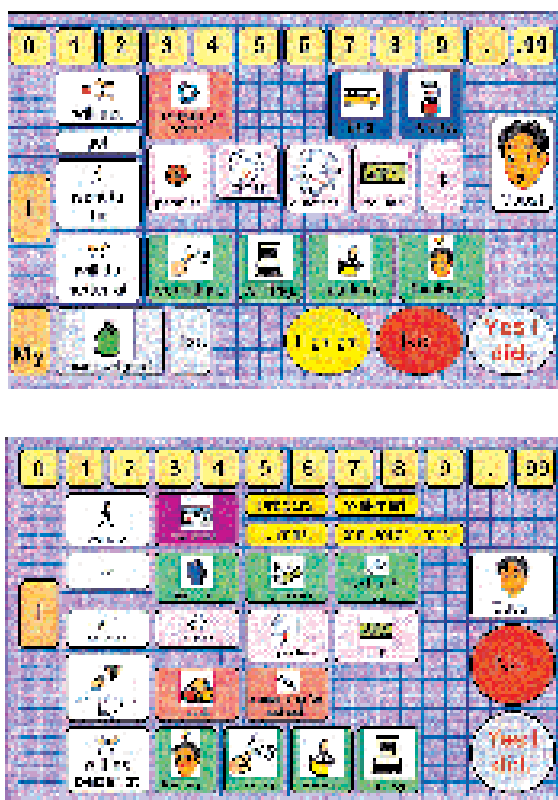
**Sandra's initial trial with the art class activity showed that 4% of her responses were made independently. By the fourth trial she increased her independence to 35%.**



**Figure 2. Amanda's IntelliKeys Overlay**



**Figure 3. Amanda's Additional IntelliKey Overlays**



**Figure 4. Example of Amanda's Responses to One Activity Question**

Prompt	Day 1	Day 2	Day 3	Day 4
Did I use my money?	Yes I did.	Yes I did. I	Yes I did.	Yes I did. I

“choose the right one” or “look” key, both located at the bottom of the overlay toward the left (Figure 6 on page 16). It is not clear if the location of the activated keys on the overlay was a factor.

### External Review

Each alternate portfolio in this study was scored at the regional level by trained teams of scorers using a double-blind method. Table 4 (page 16) presents the two scores awarded each portfolio. Out of a total of 40 possible scores when including each dimension, the portfolios carried 36 distinguished ratings and 4 proficient ratings. This results in a 90% distinguished rating when considering each dimension separately. The alternate portfolio is scored holistically, however, assigning one score to each complete portfolio. These four students received a rating of “distinguished.”

### Overlay Design

The design of the custom overlay is an important consideration in the success of student use of the IntelliKeys. Thorough knowledge of student need and capabilities of the device is essential to use the customizing features and maximize student potential. As a result of this study, we can share several design tips (see box on page 17, “Design Tips for Customizing IntelliKeys Overlays”). Experimentation based on observation, however, is the most important element.

First, overlay design must be student centered. Motor and cognitive abilities guide the spatial arrangement of the overlay. Range of motion and reach are considerations for the placement of buttons. Items that will be needed more frequently should be easily within reach to avoid fatigue and frustration. Fine motor

**The design of the custom overlay is an important consideration in the success of student use of the IntelliKeys.**

abilities are factored into button size. For students with cognitive impairments, color and clustering can facilitate use. Buttons in close proximity should be related to a single task and may be highlighted in a specific color to provide cues to the student for their use. These design considerations are especially useful with more complex overlays.

Cognitive abilities play a role in the number of buttons or response options, and the design of the button depends on the student's cognitive level (for example, contrast Amanda's overlay in Figure 2 with Brent's in Figure 5). Type of graphic representation of a response option is critical. Pairing the written word with the picture will be beneficial for some students, but detrimental to others.

If using different layouts for different tasks, it is important to maintain as much consistency across the layouts as possible. For example, you may always put program commands (e.g., enter, space, delete) in the upper left quadrant and task-specific content keys in the lower right. In doing so, you reduce the cognitive load on the students as they complete each response. Taking both cognitive and motor abilities into account, you facilitate increased accuracy and reduction of time, which both contribute to fatigue.

### Final Thoughts

In addition to the data showing the achievements of the students with disabilities, observations of the students working with their peers on these tasks

confirmed other benefits of the program. Overall, the peers gained a better perspective on the students' abilities, and the students responded positively to their accomplishments and interactions with their peers (see boxes,

Figure 5. Brent's IntelliKeys Overlay

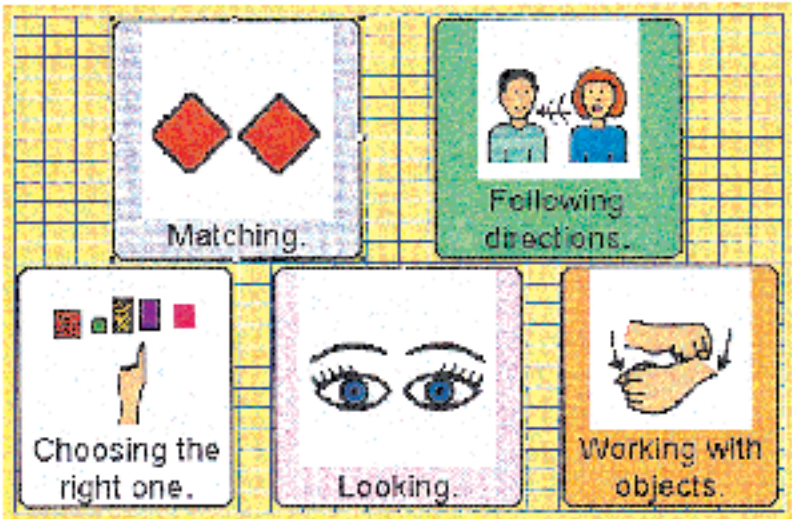


Figure 6. Example of Brent's Responses to One Science Activity Question

Prompt	Student Response			
	Day 1	Day 2	Day 3	Day 4
Next time I will try harder	Choose the right one	Choose the right one	Look	Look

Table 4. Scores Received from Two Reviewers on the Alternate Portfolio Dimensions

Student	Amanda	Christine	Sandra	Brent
Performance	Distinguished	Distinguished	Distinguished	Distinguished
	Distinguished	Distinguished	Distinguished	Distinguished
Support	Distinguished	Proficient	Distinguished	Distinguished
	Distinguished	Distinguished	Distinguished	Distinguished
Settings	Distinguished	Distinguished	Distinguished	Distinguished
	Distinguished	Distinguished	Distinguished	Distinguished
Social relationships	Proficient	Distinguished	Distinguished	Proficient
	Distinguished	Distinguished	Proficient	Distinguished
Contexts	Distinguished	Distinguished	Distinguished	Distinguished
	Distinguished	Distinguished	Distinguished	Distinguished



### Design Tips for Customizing IntelliKeys Overlays

- Student needs and functioning level must drive the content and format.
- Use voice output to read the prompt and read the response back to the user.
- Group keys according to color to facilitate correct responses.
- Enable the "nonrepeat" function to ensure only one entry per response.
- Use left-to-right formats to naturally facilitate sentence construction.
- Size the text and the keys to match the visual abilities of the user.
- Program whole words and phrases into the keys to speed responses.
- Match the programmed responses to the student's cognitive ability (e.g., single-word responses limit the construction of complete sentences).
- Outline keys in black to improve contrast.
- Place frequently used keys on the user's dominant side of the keyboard.
- Include graphics on the keys with the text for the nonreader.
- Consider the complexity of training issues when choosing keys (e.g., arrow keys for directional movement are very difficult to teach).
- Place keys that are common across overlays in a consistent location on each.

### Sample Peer Responses to Interview Questions

Six general education peers helped the students use the IntelliKeys during recording sessions. The overwhelming consensus was that the peers liked using the IntelliKeys with the students, primarily because it enhanced the student level of performance and increased their independence. The following are some of their responses:

- One peer appeared quite shocked at Amanda's performance within her math entry, and remarked that he did not know "she could do all that."
- Most peers were surprised with work that the students were able to produce with the IntelliKeys, and admitted that it elevated their opinion of the students' ability.
- Observations indicated that the peers enjoyed the process of working with the students, though this was in the form of a peer-tutor relationship.
- Each peer reported that working with a student helped him or her to get to know the student better, since they spent more time together. Spending time with one another provided the opportunity for relationships to develop, an important element within the social relationships dimension of the alternate portfolio.

ers might look at overlay design and attempt guidelines to facilitate increased independence, increase output, and minimize the potential for student error.

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### Sample Student Responses Recorded in Observation Notes

- "Amanda appears to enjoy the technical aspects of the program; perhaps it gives her a sense of independence that she cannot get from other methods of reading and writing."
- "Amanda appears pleased with her work. At no time does she appear hurried or anxious to get finished. The teacher does not have to remind her to remain on task."
- "Christine was compliant in coming to the computer. She appears to enjoy computer tasks since it does give her an avenue for written expression and she likes to take things home."
- "Christine's mother came into the classroom when she was completing the activity sheets and Christine became animated and demanded that her mother watch what she was doing."
- On her first trial with the IntelliKeys, Sandra "grinned and clapped as each entry was keyed into the cell and read with the text-to-speech software as she typed."
- During Brent's first trial completing the science activity sheet, "Brent voiced and resisted being seated in the chair by the computer. He looked upwards at all times and avoided contact with the IntelliKeys and the monitor."
- Brent "does better on the computer than he does with the stamps since he is selecting the key and is the cause of the entered text."

textHELP! (1999). Read & write. [Computer software]. Antrim, N. Ireland: Author.

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"Sample Student Responses," for student observations and peer interviews).

This series of case studies denotes a beginning level of research, and is an indication for further definitive research at a critical time when states are looking to include students with moderate and severe disabilities in their accountability indexes. Studies of a more rigorous method of inquiry and more reliable data collection in the area of student support and assistive technology and assessment are essential. Kentucky is the only state fully including the assessment of this population in their school accountability indexes, and thus provides an excellent base for research.

Another area of focus for future research is on overlay design issues, because it is apparent that they influence output. Researchers and practition-

